High-Assurance Autonomous Nuclear Reactor Control with Emerson Ovation

Dane A. Sabo, NRC Fellow | Advisor: Dr. Daniel G. Cole

Goal: Develop autonomous hybrid control systems with mathematical guarantees of safe and correct behavior that lower operating costs for nuclear power.

Problem:

Nuclear power is ideal for future energy needs, but is expensive.

Electricity consumption at U.S. data centers is expected to more than double by 2030

Total electricity consumption by U.S. data centers (terawatt-hours)
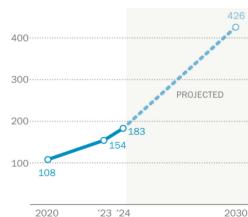
Source: Pew Research Center, Data from IEA

Source	Total ($/MWh)	O&M ($/MWh)
Adv. Nuclear	88.24	**18.50**
Natural Gas	39.00	2.90

Source: EIA Annual Energy Outlook 2022

Solution:

To address this, we use new formal methods technologies to build autonomous controllers that are provably safe.

images/procedures-icon.pn Synthesizing Procedures

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images/automata Into Discrete Automata

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images/controll Safe & Secure Autonomous Controllers

The Proof

SmAHTR Simulation

Hardware-in-Loop

Emerson Ovation